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Module 12 Lab Activity: Factorial Designs
PSY 652 Research Methods
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Description of the dataset:

A team of sleep researchers sought to study the effects of a 6-week sleep intervention aimed to improve participant's sleep hygiene. Sleep hygiene encompasses a variety of practices and habits that are necessary to have good nighttime sleep quality and full daytime alertness. The team formulated three different versions of the intervention. The first version (condition 1) provided participants with a self-help book on the topic of sleep hygiene. The second version (condition 2) brought participants together once per week in groups of 10-12 to teach the principles of sleep hygiene in a classroom setting. The final version (condition 3) also used the group-based classroom setting of condition 2, but in addition, each participant's partner was invited to also take part in the group sessions. Six-hundred male and female adults living with an intimate partner and suffering from a sleep disorder were recruited to take part in the study, the participants were randomly assigned to one of the three conditions. The data set includes the following variables:

- **sex**: 1=male, 2=female
- **age**: Participant's age in years
- **anxiety**: Participant's level of general anxiety measured at the start of the study via a multi-item scale. The scale (average of all items) ranges from 1 to 7, where a higher score indicates a higher level of anxiety.
- **prior**: An indicator of whether or not the participant had previously participated in some type of sleep intervention, 1 = yes, 0 = no.
- **hygiene**: Participant's sleep hygiene at week 6. It ranges from 0 to 10, and higher means better sleep practices.
- **support**: Participant's perception that their partner is supportive of their struggles with sleep and their efforts to improve sleep. It is a multi-item scale that ranges from 1 to 5, where higher indicates more support.
- **sleep**: Participant's average sleep efficiency during the month following the intervention, calculated as time spent in bed asleep (minus all the awakenings), divided by the total time spent in bed. It is expressed as a percentage.
- **lifesat**: Participant's sense of life satisfaction measured 30 days after the completion of the intervention. It is a multi-item scale that ranges from 1 to 7, where a higher score indicates more satisfaction.
- **cond**: Treatment condition, 1 = self-help, 2 = group-based intervention, 3 = group-based plus partner participation.

Assignment instructions:

1. Download the "slpdata.csv" dataset from the Module 12 Lab dropbox folder and save it into a project folder.
2. Create a new R notebook and name the file.

3. Create a new R chunk with a first level header: “Load Libraries”
    a. Load the psych, tidyverse, car, lsr and MBESS packages (you will probably need to install some of these)
4. Create a new R chunk with a first level header: “Import Data”
    a. Read in the “slpdata.csv” dataset, assign it to an object named “slp”
5. Create a new R chunk with a first level header: “Factor the grouping variables”
   Copy and paste the following code into a new R chunk and click run

```
slp <- mutate(slp, female = ifelse(sex == 1, 0, 1), female.f = factor(female, levels = c(0,1), labels = c("male", "female")))

slp <- mutate(slp, cond.f = factor(cond, levels = c(1,2,3), labels = c("self help", "group-based", "group + partner")))
```

This creates factor versions of the variables for sex (now called female.f) and sleep treatment condition (now called cond.f) variables. This tells R to read these variables as factor (i.e., categorical) variables. Check that this worked by opening the dataframe in your global environment.

6. Write a first level header: “Calculate descriptives”
    a. Create a new R chunk with a second level header: “For whole dataset”
        i. Use any method to calculate descriptives for the sleep dataframe
    b. Create a new R chunk with a second level header: “Descriptives by grouping variables”
        i. Use the aggregate function to calculate the mean StressLevel for male versus female participants in each of the three treatment conditions. Use the factor versions of these variables (the ones you just created that end in .f)

Hint: aggregate(x= data$outcome, by=list(data$groupvar1, data$groupvar2), FUN=mean)

    c. In the white space, write 1-2 sentences interpreting how the means differ by gender and treatment condition, and how the groups means compare to the grand mean for sleep.
7. Write a first level header: “Visualize the data”
    a. Create a new R chunk with a second level header: “Create boxplots of sleep efficiency across treatment groups”

Hint: ggplot(dataset, aes(y = outcome, color = groupvar1)) + geom_boxplot()

    b. Create a new R chunk with a second level header: “Create boxplots of sleep efficiency across treatment groups and sex”

Hint: ggplot(dataset, aes(y = outcome, color = groupvar1)) + geom_boxplot() + facet_wrap(~groupvar2)

    c. In the white space, write 1-2 sentences interpreting these plots.

8. Create a new R chunk with a first level header: “Conduct a factorial ANOVA”
    a. Conduct a 2-way independent ANOVA in which sleep is regressed on female.f, cond.f, and the interaction between these two predictors.
    b. Use the Anova() function to output the results as a Type III ANOVA
    c. In the white space, answer the following questions:
        i. Interpret the *F* statistic for each predictor and for the interaction effect.
        ii. Why did we use a Type III ANOVA (why is this method typically preferred)?
9. Create a new R chunk with a second level header “Calculate effect sizes”
    a. Use the etaSquared function from the lsr package to compute the eta squared and partial eta squared values for each effect. This function saves you the time of writing the formulas for these values, but note that you should still know how to calculate these if needed.
    Hint: etaSquared(*model*, type = 3, anova = FALSE)

    b. In the white space, interpret the η^2 and partial η^2 values for each main effect and the interaction effect.
    c. Use the ci.pvaf function from the MBESS package to calculate 95% confidence intervals for the partial η^2 values for the female.f variable, the cond.f variable, and the interaction between the two.
    Hint: ci.pvaf(F.value = *Fvalue*, df.1 =df_{hyp}, df.2 = df_{err}, N = *SampleSize*, conf.level = .95)
    d. In the white space, interpret the confidence intervals for each partial eta squared.